

## THE LONG TERM EFFECT OF FERTILIZATION ON THE CONTENT OF SOIL MICRONUTRIENTS

**VIOLETA SIMIONESCU\*, MONICA TANC\*\*, I. BULICA\*\*, DANIELA PLESOIANU\***  
**\*Ovidius University - Constanta, \*\*SCDA Valu lui Traian-Constanta**

**Key words:** long term, experiment, nitrogen, phosphorus.

### ABSTRACT

*This work paper shows the research results of the statesupplyingsoil with micronutrients(iron, boron andzinc)after38years fertilizationwith nitrogenand phosphorus. The analyses wereperformed onsoil samplestaken from one long termexperimentwithfertilizerfromResearch StationofAgricultural DevelopmentofValuTraian, Constanta.*

*The applying the increasing dosesof nitrogenand phosphorushavenegatively influencedthe soilcontentinmicronutrients iron andboron. These are between inthe normal limits of supply to themost variantsexperienced.*

*Itfoundalowlevel ofzincsupplyover0.5ppmbut less than 1ppminall variantsof fertilizationwith nitrogenand phosphorus.*

*The application ofhigh doses ofphosphorus (in particular) andnitrogencausedadecreaseinzincccontentof the soil.*

### INTRODUCTION

Although found in plants, each of them in proportion to <0.01%, the microelements plays a complex and important role in physiological processes in the plants. The lack of them or excess can cause disturbing processes of plant for growth and development. Also, the lack or excess content of microelements in plants can cause toxicities in the plants and some diseases to animals and humans.

The microelementsare found in the soilingquantitiesrangingfrom one area toanother and fromonesoil typeto another, depending on parentrock, stagechemical processesof alterationminerals, how tousethe land. It was found that the clay soilshave ahigercontentinmicronutrientsthansandy soils.

### MATERIALANDMETHODOFRESEARCH

The researcheswereperformed atthe Research Station for Agriculture and DevelopmentValu luiTraianin along termexperiencewith chemical fertilizerswith nitrogenand phosphorus. The experiment was setin 1970by Mr.DoctorHoriaSimota. The researchgoalsin theseexperimentsare very interestingtodaytheytargeting that

- The study of effects about usingfertilizerson soil,plants andthe environment.
- To identify the factorswhich leading tolimityields.
- The studyon the qualityof the harvest.
- Performing the nutrient survey
- Getting theinformation about the biology ofsoil, the microorganismsactivity as a result ofdifferent techniques ofillage,crop rotationandfertilization.
- knowing therateof mineralization oforganic matteras a result ofthe differenttechniquesofillage,crop rotationandfertilization
- to ground a system of crop fertilization for steppe conditions from Dobrogea area, which ensureshigh yieldsand quality

These goals are common to all long term experiment placed in agricultural research stations located in areas with soils and climate representative in the country. In the experimental field have been located laid experiments by the method two-way randomized blocks with plots in three replications. The surface of the experimental variants was 60 m<sup>2</sup>.

### **The experiment factors:**

#### **Factor A - The dose of phosphorus (kg / ha P<sub>2</sub>O<sub>5</sub>)**

- a1 – P0
- a2 – P50
- a3 – P100
- a4 – P150
- a5 – P200

#### **Factor B - The dose of nitrogen (kg / ha N)**

- b1 – N0
- b2 – N50
- b3 – N100
- b4 – N150
- b5 – N200

From the combination of these two graduations factors were resulted twenty-five variations and experiment.

It used the ammonium nitrate and superphosphate. Phosphorus fertilizers were applied each year before making plowing. Nitrogen fertilizers were applied each year before spring time.

The soil samples were taken from field and were prepared for analysis. Extraction and determination of trace elements was done by STAS: for iron extraction was done in 0.1 N HCl and then determining AA analyzes; the boron determined by ASTM-sulfuric acid method carmine; the zinc was obtained by extraction in 0.05 M Na<sub>2</sub>EDTA and determined by AA.

Soil type is Verma Chernozem and it has the following physicochemical characteristics:

The texture is sandy loam; clay content is 34.7% and 37.0% of Ap1 in Ap2h (25-30 cm), decreasing to 26.4% in Cn2k (130-160 cm).

The main hydroindexes are from medium to large; CH decreases from 8.8% - 9.0% in the first 30 cm (Ap1 - Ap2h) from 8.6% to 6.2% in Amk and Cn2k; Co., from 10.2% - 13.5% in Ap1 and Ap2h decreases in Amk 12.9% and 9.3% in Cn2; DCh has values of 26.8% - 25.1% in A and 24.3% - 22.0% in C.

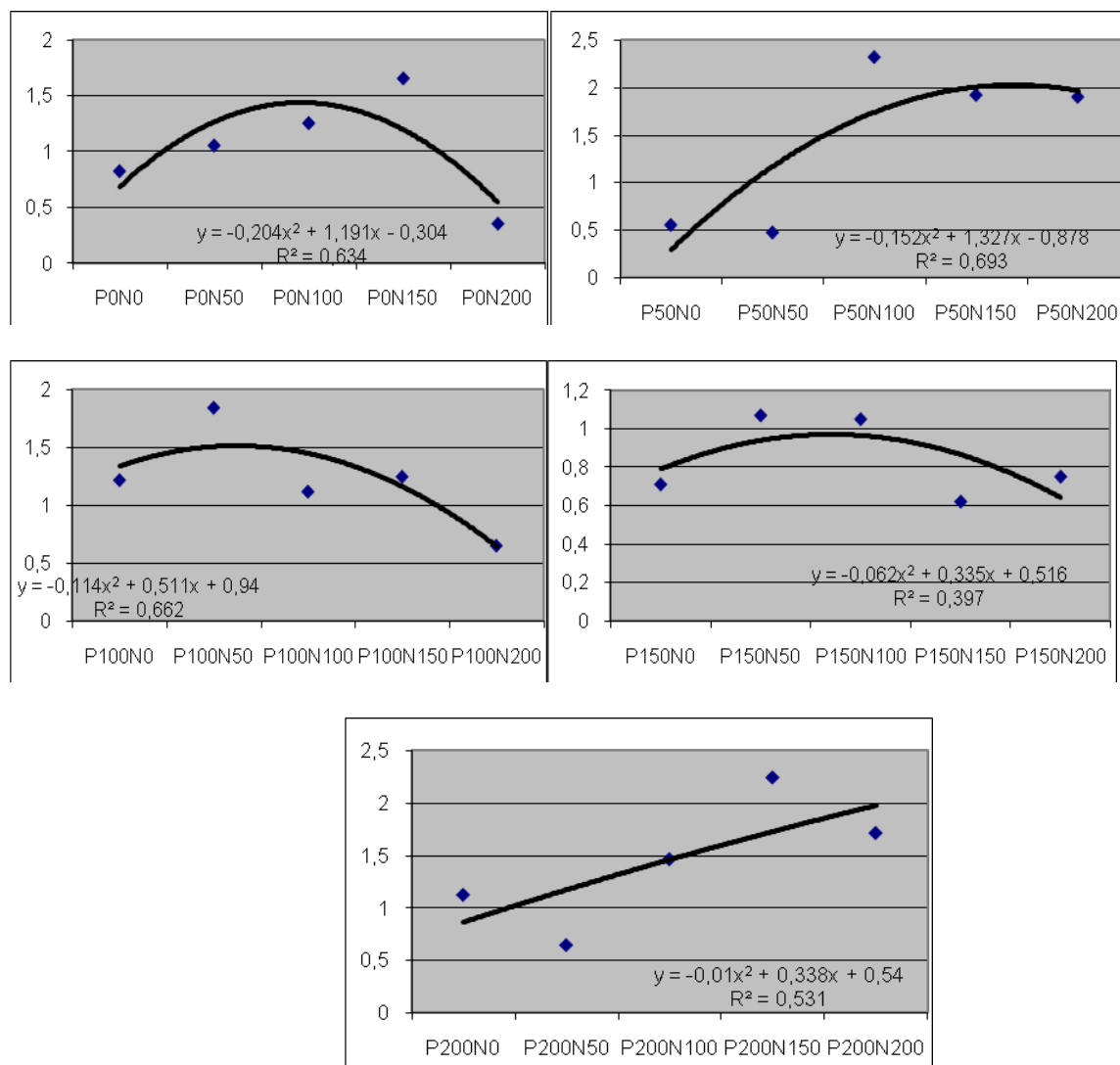
- The humus content is relatively high to medium in A (3.5% - Ap1, 2.7% - Ap2h, and 2.6% - Amk) and decreases in A / Ck (1.9%) and C (1, Cc 1% - 0.5% Cn2k).
- The nitrogen index (IN) has a value of 3.5 in Ap1.
- The base saturation (V) is very high values: 93.9% - 100%. Exchangeable hydrogen (SH) has very low values (6.1 to 5.4 me / 100 g soil).
- The neutral reaction is slightly alkaline (pH 7.8 to 8.4).

## **RESULTS**

The Iron content in the soil after 38 years of application of Nitrogen and phosphorus fertilizers. The Iron is necessary for its role in maintaining plant chlorophyll in condition. It is active for enzymes and is involved in redox processes from plants.

The low iron is showing by reduced growth plant and appearance of yellow leaves. The iron is found in the Earth's crust up to 4-5%. In soil we have three forms of iron: unchangeable, exchangeable and soluble. We determined the soluble form. These forms of iron are influenced by the pH of the soil, the supplying with the calcium carbonate, potassium and

manganese of soil. In the control variant(N0P0) has a lowest iron supply(0.8ppm). Applying increasing doses of nitrogen and phosphorus haven't a negative impact on soil iron content, that been in the normal limits supply in most variants tested (fig. 1).

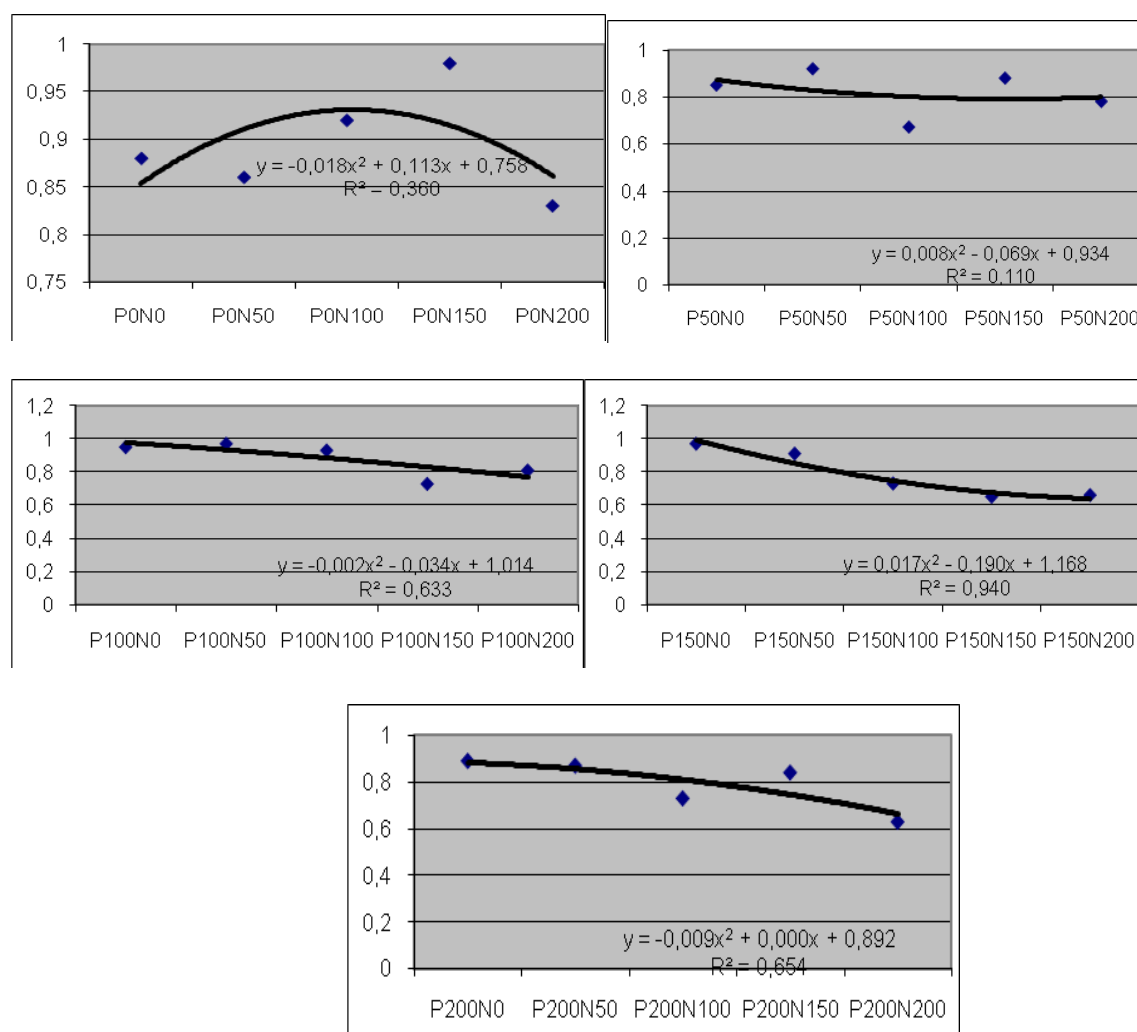


**Fig. 1 -The Evolution of the iron content of the soil under the influence of increasing of nitrogen and phosphorus doses**

### **The Boron content in soil after 38 years of application of Nitrogen and phosphorus fertilizers**

The Boron is an important element to ensure a better protection of plants against diseases. The Boron deficiency causes destruction of the main stem apex, shoots development and apex death in a short time, turning leaves, etc. The Boron deficiency occurs when soluble boron soil content is under 0.4-0.5 ppm.

In our experiment the supply of boron in soil after 38 years of application of fertilizers with nitrogen and phosphorus, is in the normal range (fig. 2).



**Fig. 2 -The evolution of soil boron content under the influence of increasing nitrogen and phosphorus doses**

### **The Zinc content from soil after 38 years of application of Nitrogen and Phosphorus fertilizers**

Generally, the Zinc is an important element in plant life and especially for grain, corn and vegetables. It is in the composition of a lot of enzymes and takes part in catalysis of compounds that participate in plant growth. The Zinc deficiency is showed by stop of plant growth, reducing internodes, small leaves arranged in a rosette, leaf chlorosis, plant stunting, etc.

Following the evolution of zinc content in soil in experimental variants see that the supply is low, below 1 ppm in all variants. Zinc content in soil under the influence of phosphorus dose is almost the same (Figure 3), whatever of them size.

The application of high doses of phosphorus (in particular) and nitrogen for a long time caused the decreased zinc content from the soil.

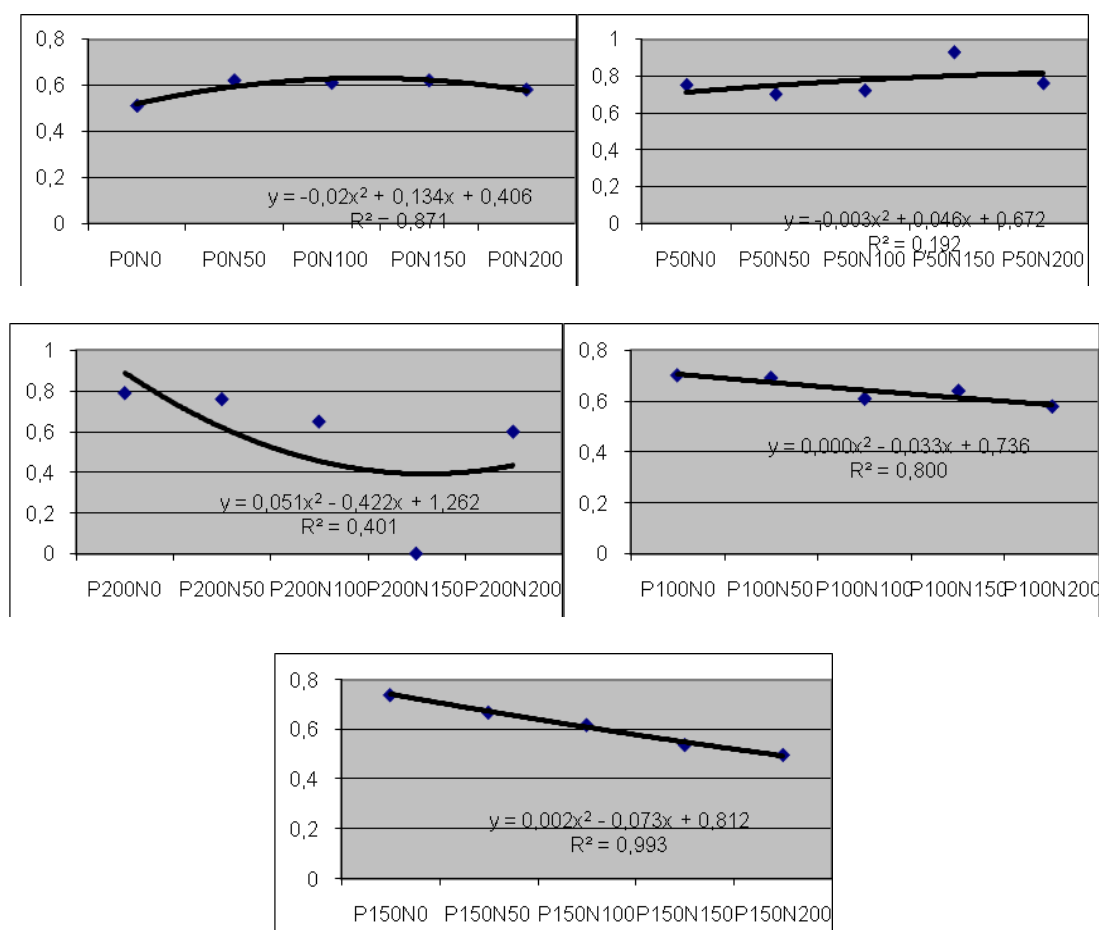


Fig. 3 - The evolution of zinc content from soil under the influence of increasing nitrogen and phosphorus doses

## CONCLUSIONS

The application of increasing doses of nitrogen and phosphorus have negatively influenced the soil content in microelements iron and boron, those are in the normal range of supply in most variants of experiment. We found a low level of zinc supply, over 0.5 ppm but less than 1 ppm in all variants of nitrogen and phosphorus fertilization. The application of high doses of phosphorus (in particular) and nitrogen on long term decreased the zinc content from the soil.

## BIBLIOGRAPHY

1. BORLAN, Zenoviu, HERA, Cristian, 1973, *Metode de apreciere a stării de fertilitate a solului în vederea folosirii raționale a îngrășămintelor*. Editura Ceres, Bucuresti, 487 pag.
2. BORLAN, Zenoviu, HERA, Cristian, 1975, *Ghid pentru alcătuirea planurilor de fertilizare*. Editura Ceres, Bucuresti, 279 pag.
3. BORLAN, Zenoviu, HERA, Cristian, 1980, *Ghid pentru alcătuirea planurilor de fertilizare, (Editia 2-a)* Editura Ceres, București, 341 pag.
4. BORLAN, Zenoviu, HERA, Cristian, 1984, *Optimizarea agrochimică a sistemului sol-plantă*, Editura Academiei Române, București, 271 pag.
5. Davidescu, David, I Calancea, Velicica Davidescu, Gh. Lixandru, C. Tardea, *Agrochimie*, Editura Didactica si Pedagogica, Bucuresti, 1981.